

UC Merced/Labs21 Pilot Partnership Update: Completion of Design for the Science and Engineering I Laboratory Building

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Labs21 Pilot Partnership Update

University of California at Merced—The 10th Campus



**Long Range Development Plan:
25,000 students**

**Most severe climate in UC system:
102 F (39 C) summer design (0.4%)
30 F (-1 C) winter design (0.4%)**

**High laboratory density:
35% of buildings?**

**Chancellor's initiative for
environmental stewardship**

UC Merced/Labs21 Pilot Partnership

First Laboratory Building (Science & Engineering I)

Gross Floor Area:
173,000 Square Feet

3 Floors
plus Partial Basement

Research Labs, Teaching
Labs, Offices

95 Fume Hoods



Goals for UC Merced/Labs21 Pilot Partnership First Laboratory Building (Science & Engineering I)

- ◆ **Energy Intensity at 80% of 1999 UC/CSU Average Benchmark**
 - Equivalent target relative to California Title 24 Energy Standards
 - Goals for peak loads and annual energy use
- ◆ **Water Efficiency**
- ◆ **LEED™ Silver Rating**
 - Option for self-certification
- ◆ **Life-cycle Costing**
- ◆ **Commissioning**

Goals for UC Merced/Labs21 Pilot Partnership Beyond the First Laboratory Building

- ◆ **Whole Building Approach Integrated with Infrastructure Plan**
- ◆ **Monitoring of Energy & Water Performance**
- ◆ **Further Reduce Energy Intensity for Future Buildings**
 - 65% or less of 1999 UC/CSU Average Benchmark for next buildings
 - 50% or less of 1999 UC/CSU Average Benchmark for rest of campus
- ◆ **Investigate On-site Hydro, PV, CHP Systems**
- ◆ **Transfer Experience**
 - to other UC Merced campus facilities
 - to other UC/CSU campuses

UC Merced/Labs21 Pilot Partnership Progress

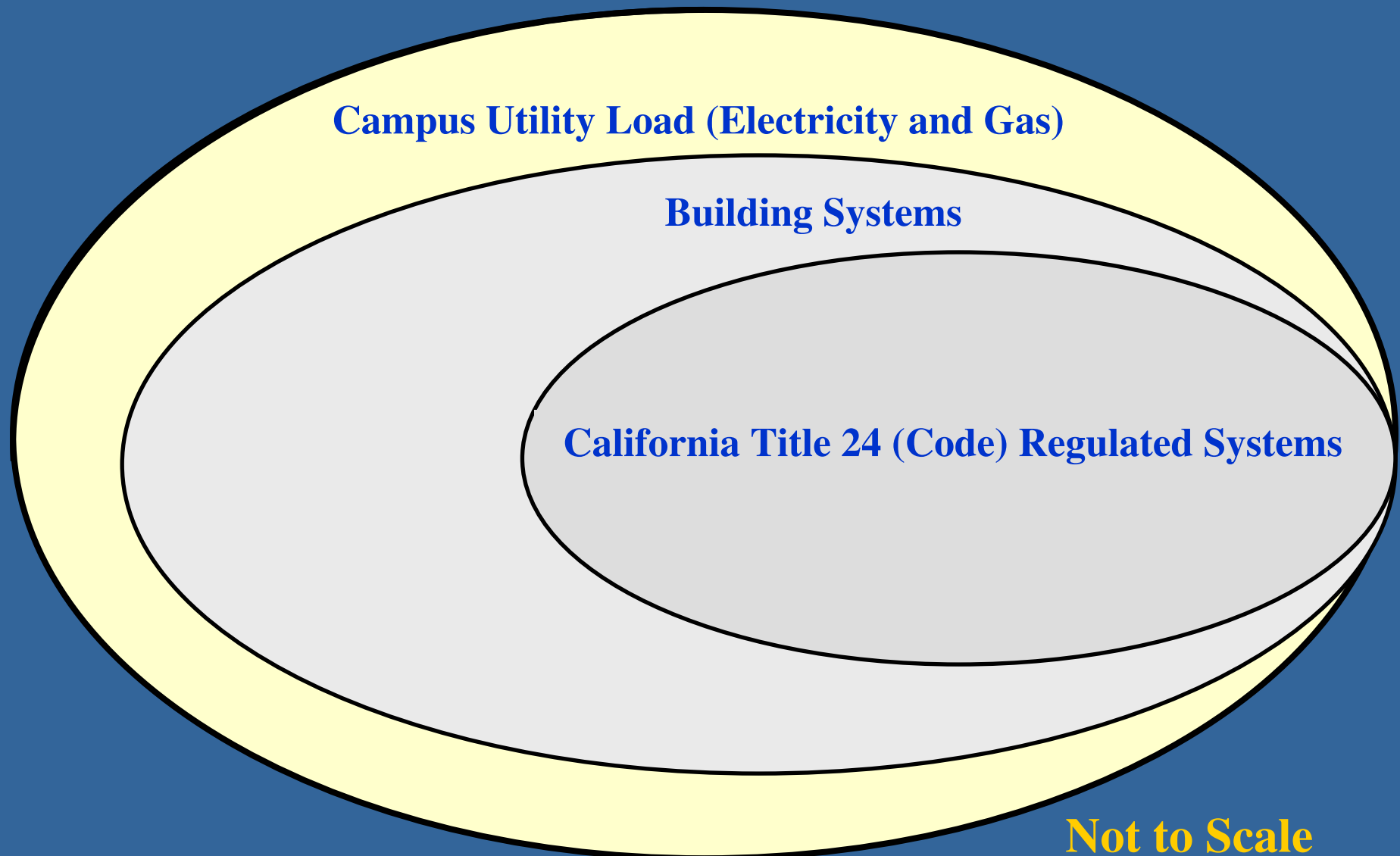
First Laboratory Building (Science & Engineering I)

Preliminary Energy Analysis at Completion of Design:

- ◆ 30% below 2001 CA Title 24 maximum on a source energy basis
 - Utility “Savings by Design” incentive program application
- ◆ >30% below 2001 CA Title 24 maximum on an energy cost basis
 - Draft LEED™ analysis

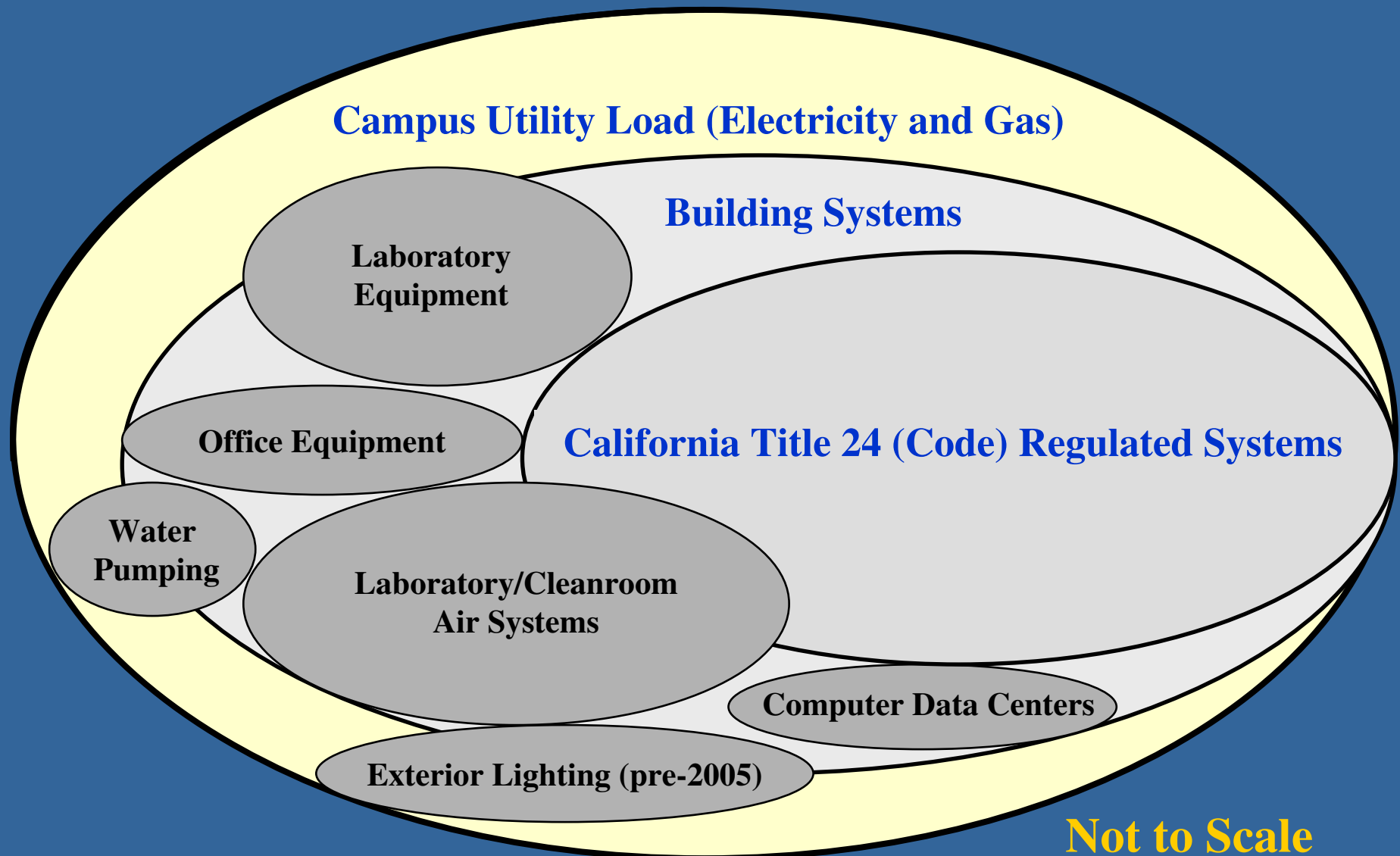


Campus-Wide Energy Management Building Design Standards Are Not the Whole Story



Campus-Wide Energy Management

Building Design Standards Are Not the Whole Story



Campus-Wide Energy Management

Building Design Standards Are Not the Whole Story

Transportation
Energy

Campus Utility Load (Electricity and Gas)

Building Systems

California Title 24 (Code) Regulated Systems

EV
&
NGV

Laboratory
Equipment

Office Equipment

Water
Pumping

Laboratory/Cleanroom
Air Systems

Computer Data Centers

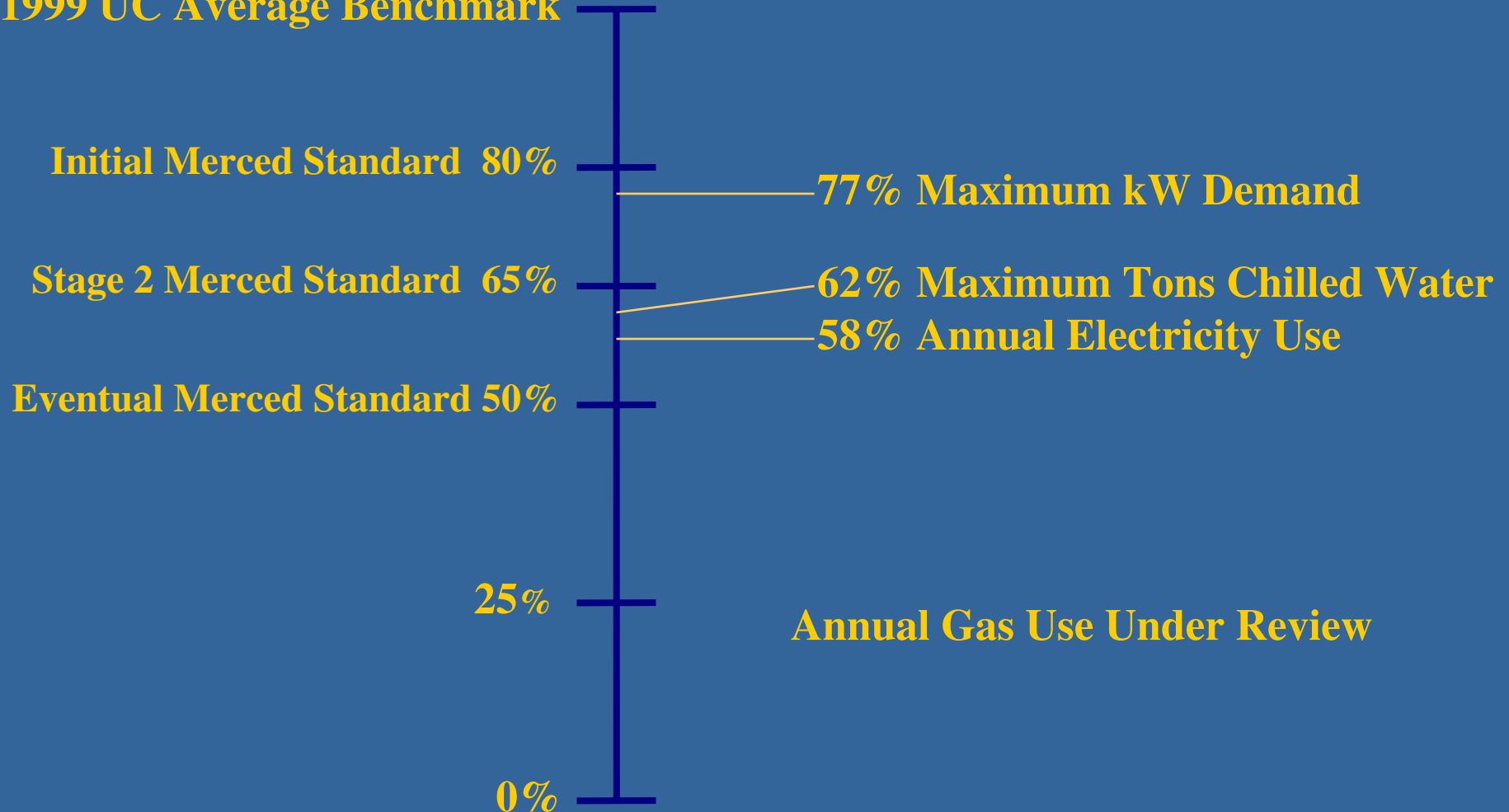
Exterior Lighting (pre-2005)

Not to Scale

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First Laboratory Building (S&E I)—Preliminary Analysis

1999 UC Average Benchmark



UC Merced/Labs21 Pilot Partnership Progress First Laboratory Building (Science & Engineering I)

On Track for Silver LEED™ Rating Including (1 of 2):

- ◆ **Water Efficient Landscaping: 50% Reduction in Use**
- ◆ **20% Building Water Use Reduction**
- ◆ **Up to 10 Energy Efficiency Credits**
 - including TES-based Cost Reduction
- ◆ **Additional Commissioning**
- ◆ **Elimination of HCFCs and Halon**
- ◆ **Measurement and Verification**
- ◆ **Innovation: Boiler NO_x Emission Reduction**
- ◆ **Innovation: Building as a Teaching Tool**

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First Laboratory Building (Science & Engineering I)

On Track for Silver LEED™ Rating Including (2 of 2):

- ◆ **Carbon Dioxide Monitoring (in Non-lab Spaces)**
- ◆ **Increased Ventilation Effectiveness**
- ◆ **Construction IAQ Management Plan**
- ◆ **Low-Emitting Materials**
- ◆ **Indoor Chemical and Pollutant Source Control**
- ◆ **Controllability of HVAC Systems (for Offices)**
- ◆ **Thermal Comfort**
 - **ASHRAE Standard 55**
 - **Permanent Monitoring System**
- ◆ **Daylight and Views**

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First Laboratory Building (Science & Engineering I)

Design Accomplishments (1 of 2)

- ◆ Indirect evaporative pre-cooling (lab outside air and some process loads)
- ◆ Variable air volume fume hood systems
- ◆ No reheat for Lab HVAC Systems
- ◆ Low pressure drop for lab air systems (how low?), tight ducts (how tight?)

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First Laboratory Building (Science & Engineering I)

Design Accomplishments (2 of 2)

- ◆ Good lighting design
- ◆ Solar control: high performance windows and sun shading
- ◆ Chiller plant efficiency including chilled water thermal energy storage
- ◆ DDC control to zone level
- ◆ Enhanced energy performance monitoring
- ◆ Commissioning

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First Laboratory Building (Science & Engineering I)

Life-Cycle Costing

- ◆ **Energy goals lower life-cycle cost**
 - No special budget allocation for energy goals or LEED™
- ◆ **Life-cycle cost not minimized**
 - Capital budget constraints

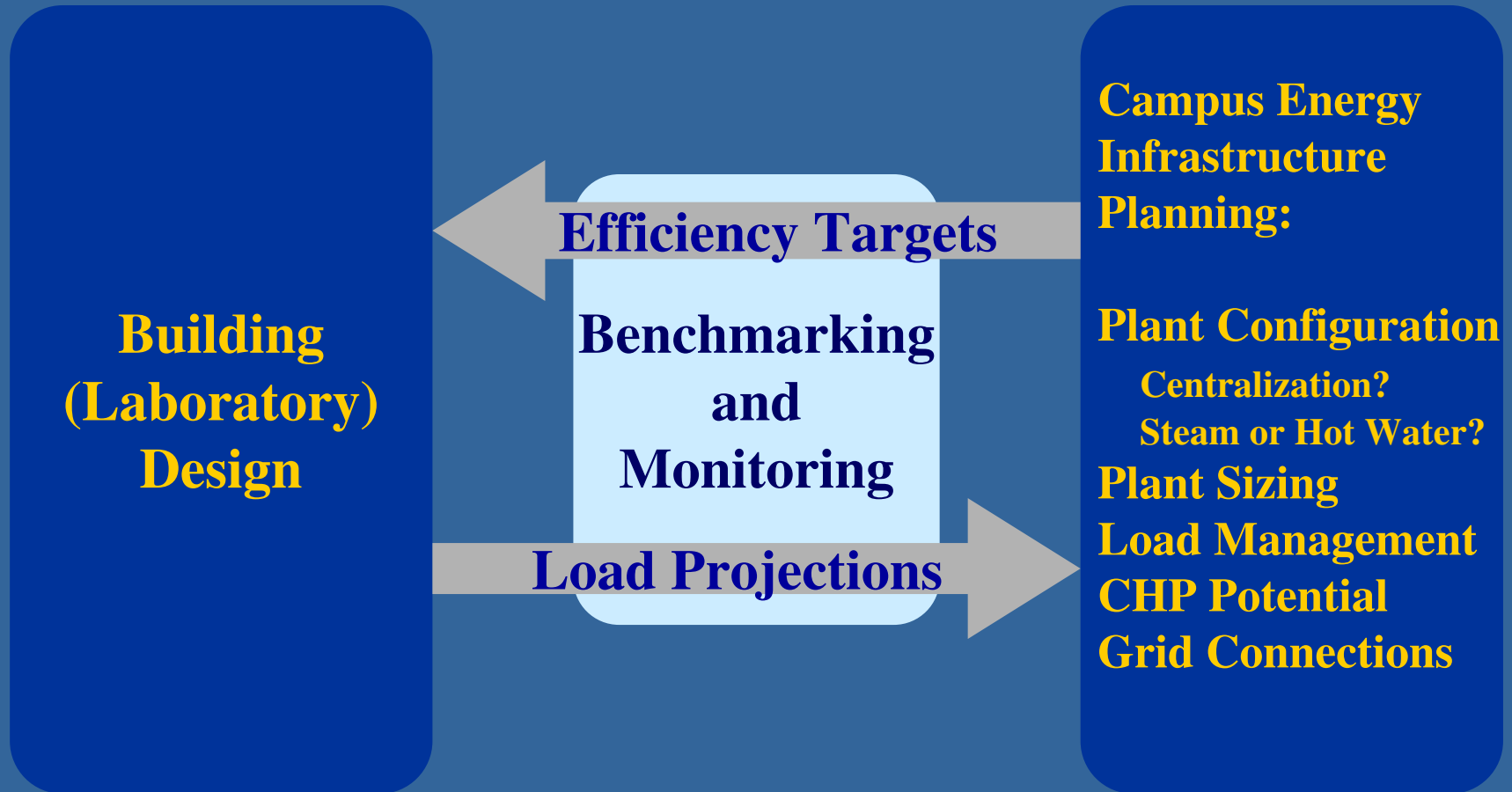
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Process Interventions

- ◆ Set firm goals for environmental stewardship
- ◆ Establish stewardship as a priority in programming and budgeting
- ◆ Select A&E consultants with stewardship as a part of their core practice
- ◆ Provide resources to engineers & lighting designers early in design process
 - Start analysis in schematic design
- ◆ Use operating experience as feedback for the design process
 - *Session H-2 Thursday 23 October 2003 9:00-10:00am:*
“A New Approach to HVAC Design:
Benchmarking and the MLM (Most Likely Maximum) Method”

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Closing the Loop for Infrastructure and Building Design



UC Merced/Labs21 Pilot Partnership Progress Beyond the First Laboratory Building

Energy System Monitoring Objectives:

- ◆ Continuous commissioning
- ◆ Energy management
- ◆ Use of the facility itself as a “living laboratory”
- ◆ Continuous improvement in design of future campus phases

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Beyond the First Laboratory Building

◆ Existing “On-site” Hydro

- Potential for direct transaction with plant owner

◆ Photovoltaics

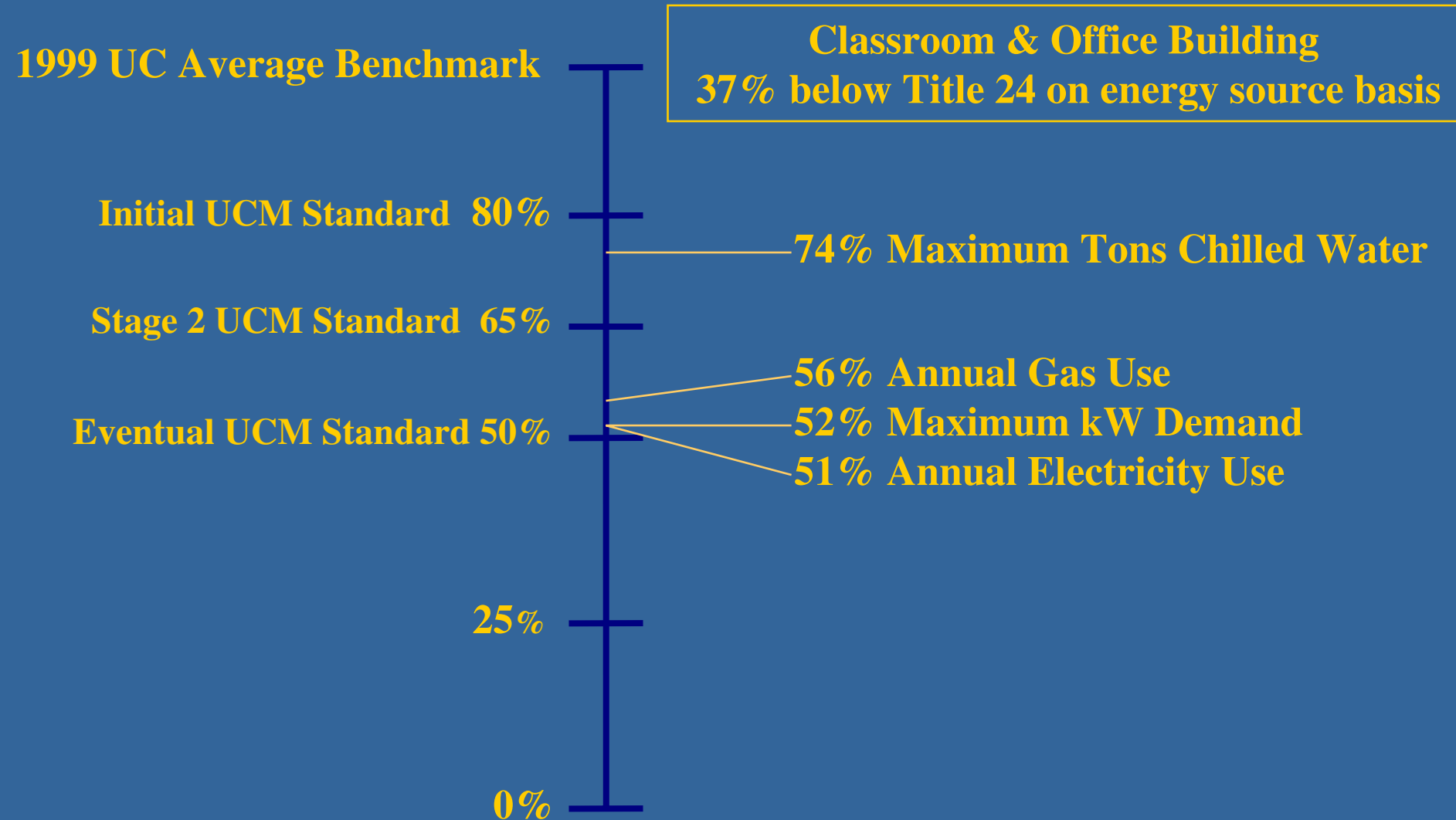
- Demand charge avoidance hard to capture with evening peak
- First year cash flow must be neutral

◆ Combined Heat and Power

- Loads will match environmentally and economically sound systems in the next decade

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Predicted Performance of Other Future UC Merced Buildings



UC Merced/Labs21 Pilot Partnership Progress Beyond the First Laboratory Building

University of California System Wide Policy (July 2003 Draft):

- ◆ **New non-lab building energy use at least 20% below Title 24**
 - Equivalent goal for lab buildings TBD
 - Acute care facility goal TBD
- ◆ **Internal documentation of LEED™ “Certified” equivalent**
 - Documentation for laboratories to be based on Labs 21 EPC
 - Acute care facility goal TBD
 - Campuses may obtain LEED™ rating in lieu of internal documentation
- ◆ **Pursue system wide purchase of energy efficient products**
 - Some types of laboratory equipment
 - *Breakfast Session Thursday 23 October 2003 8:00-9:00am:*
“Energy Efficient Laboratory Equipment”

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People

UC Merced

- ◆ **Carol Tomlinson-Keasey**
 - Chancellor
- ◆ **Lindsay Desrochers**
 - Vice Chancellor for Administration
- ◆ **Jim Smith**
 - Campus Architect
- ◆ **Steve Rabedeaux**
 - S&E I Construction Project Director
 - The Hallmark Group
- ◆ **Juan Beltranena**
 - S&E I Design Project Director
 - now Dir. of Facilities, CSU Channel Islands
- ◆ **Cynthia Hughes**
 - Campus LEED™ Coordinator
- ◆ **Ric Notini**
 - Environmental and Permitting Manager
- ◆ **Chris Adams**
 - Campus Planner

Others

- ◆ **Mo Lovegreen**
 - Assistant Dean of Planning and Administration—Donald Bren School of Environmental Science and Management, UC Santa Barbara
- ◆ **Perrin Pellegrin**
 - Campus Sustainability Coordinator, UC Santa Barbara
- ◆ **Dale Sartor**
 - Applications Team Leader, Lawrence Berkeley National Laboratory
- ◆ **Maric Munn**
 - Associate Director— Energy and Utilities, UC Office of the President

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People (continued)

Key Design Team Members: UC Merced Science & Engineering I

- ◆ **Chuck Davis, EHDD**
 - Principal-in-charge
- ◆ **Gene Sparling, EHDD**
 - Project Manager
- ◆ **Tom Heffernan, EHDD**
 - Project Manager
 - now with Dreyfuss & Blackford Architects
- ◆ **David Hurley, EHDD**
 - Project Architect
- ◆ **Michael Zaretsky, EHDD**
 - LEED™ Coordinator
- ◆ **Scott Shell, EHDD**
 - In-house Reviewer
- ◆ **Michael Fuller, Leo A Daly**
 - Project Manager
- ◆ **Jason Kim, Leo A Daly**
 - Project Architect
- ◆ **Matt Volgyi, ARUP**
 - Mechanical Engineer
- ◆ **Jon Markowitz, ARUP**
 - Plant Design Engineer
- ◆ **Janet Nolan, J. S. Nolan & Associates**
 - Lighting Designer
- ◆ **Glenn Friedman, Taylor Engineering**
 - Commissioning Coordinator, Peer Reviewer
- ◆ **Steve Taylor, Taylor Engineering**
 - Controls & Monitoring Coordinator, Peer Reviewer